Tracking Oil Spills with Coastal Drifters

NOAA's Hazardous Materials Response Division has been designated by the National Oil and Hazardous Substances Pollution Contingency Plan to provide scientific advice on the behavior and movement of oil and hazardous chemical spills in U.S. navigable waters.

When assistance is requested for a spill trajectory, HAZMAT quickly assembles preliminary information about the incident. Initial phone calls are made to NOAA's National Weather Service. Local experts, often other government scientists or academic researchers, are contacted to provide oceanographic insight for the particular spill area. Even with this effort, real-time environmental data as well as oil slick observations are crucial if a spill trajectory is to be accurate.

To enhance meteorological and on-scene spill observations and oil spill modeling capabilities, HAZMAT may deploy satellite-tracked surface buoys. Because oil changes its physical properties within hours or days of the release, selecting a buoy to track a spill over an length of time is difficult.

Initially, a spill will form a large, cohesive slick that is very thin (diameter of a strand of hair) that is transported by the winds and currents. The wind drift for the slick is typically 3 to 4% of the wind speed. Winds and currents will tear the slick into smaller patches overtime. Depending on the type of oil, water can be entrained into the slick forming an emulsion. The emulsion can contain up to 70% water and have the viscosity of peanut butter. The oil may no longer be a thin film but rather thick patties that continue to be torn into smaller pieces or tarballs. Although the tarballs are lighter than water, breaking waves can push the oil into the water column for short periods of time much like a cork bobbing in the ocean. The wind drift factor for the tarballs may be as low as 1 to 2%. Turbulence can eventually spread the tarballs over a very large area (hundreds of square miles).

The buoys only slightly change their drift characteristics overtime. This is mostly due to small marine creatures attaching to the sides of the buoy. The time scale for this change may be significant. Changing the buoy's ballast over time to simulate the changing nature of the spill for a particular oil is not possible during an emergency response. Another problem is patchiness—how many drifters have to be deployed to represent the distribution of the oil, particularly tarballs spread over hundreds of square miles?

The drifters deployed by HAZMAT are sturdy enough to be deployed from a helicopter at about 75 feet, yet light enough to be transported by winds and currents in the general direction of slick. The drifter transmits through satellite, so an aircraft or boat is not needed to find the location of drifter. If the drifter unexpectedly changes direction, the modeling team is quickly alerted and corrections are made to the trajectory as needed. The drifter will transmit for 30 days with a 1 km resolution. In general, the time scale of the spill will dictate how long data from the buoy are relevant. At some point, the buoy will no loner be representative of oil movement, but may still provide useful information on water movement.

For additional information about oil spill response, visit our website: **http://response.restoration.noaa.gov/oilaids.html**

U.S. Department of Commerce • National Oceanic and Atmospheric Administration • National Ocean Service

February 2001